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Dallman

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(54) **ROTARY CUTTER SYSTEMS AND METHODS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 205 days.

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Related U.S. Application Data

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(60) Provisional application No. 62/350,540, filed on Jun. 15, 2016.

(51) **Int. Cl.**

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A01D 101/00	(2006.01)
A01D 34/64	(2006.01)

(52) **U.S. Cl.**
CPC ***A01D 34/733*** (2013.01); ***A01D 34/736*** (2013.01); *A01D 34/64* (2013.01); *A01D 2101/00* (2013.01)

(58) **Field of Classification Search**
CPC A01D 37/733; A01D 37/736
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

10,426,082 B1 * 10/2019 Dallman A01D 34/733

* cited by examiner

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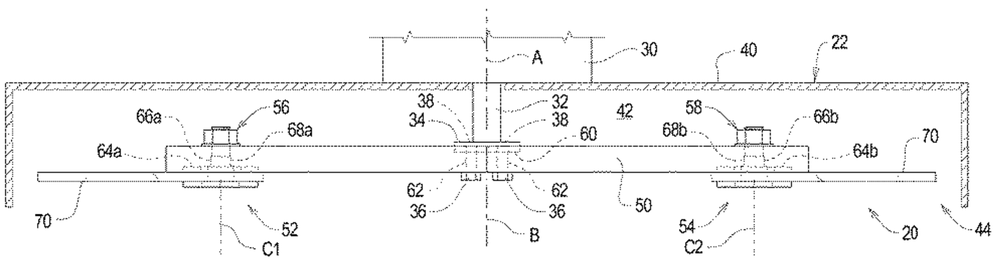
(57) **ABSTRACT**

A cutter assembly has a crossbar, cutter blades, and blade pins. The crossbar defines bar openings. Each cutter blade defines a blade bolt opening and first and second blade edges. The blade pins are each adapted to be inserted through one of the bar openings and one of the blade bolt openings such that the head portions of the blade pins are within one of blade recesses of the cutter blades. Bolt key surfaces of the blade pins engage bar key surfaces of the crossbar to prevent rotation of the blade pins relative to the crossbar. The cutter blades are each operable in first and second configurations, where the first blade edges are in a leading position in the first configuration and the second blade edges are in a leading position in the second configuration.

9 Claims, 9 Drawing Sheets



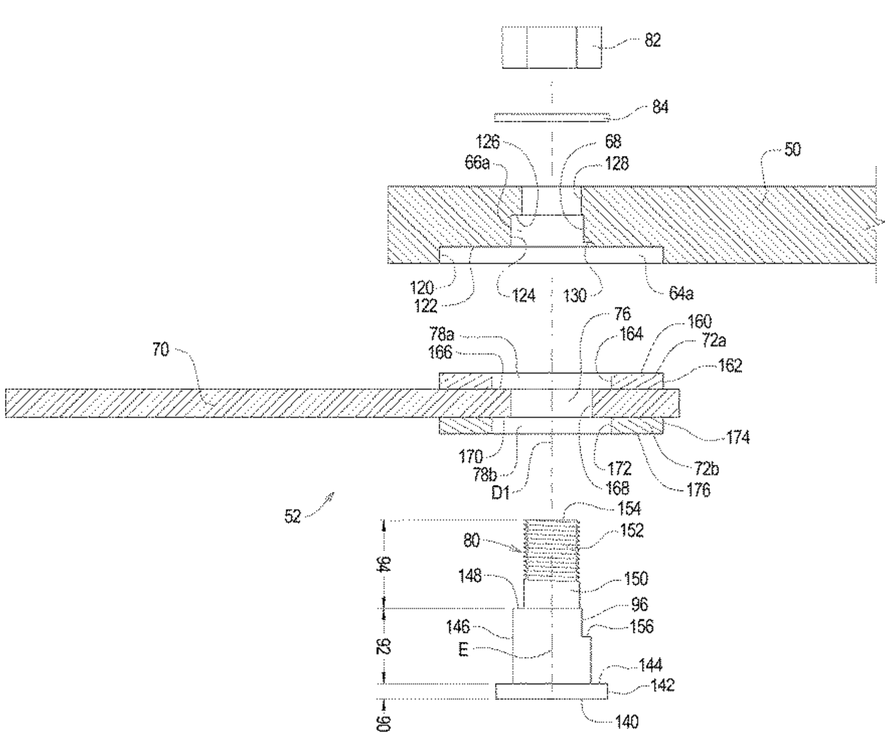


FIG. 1

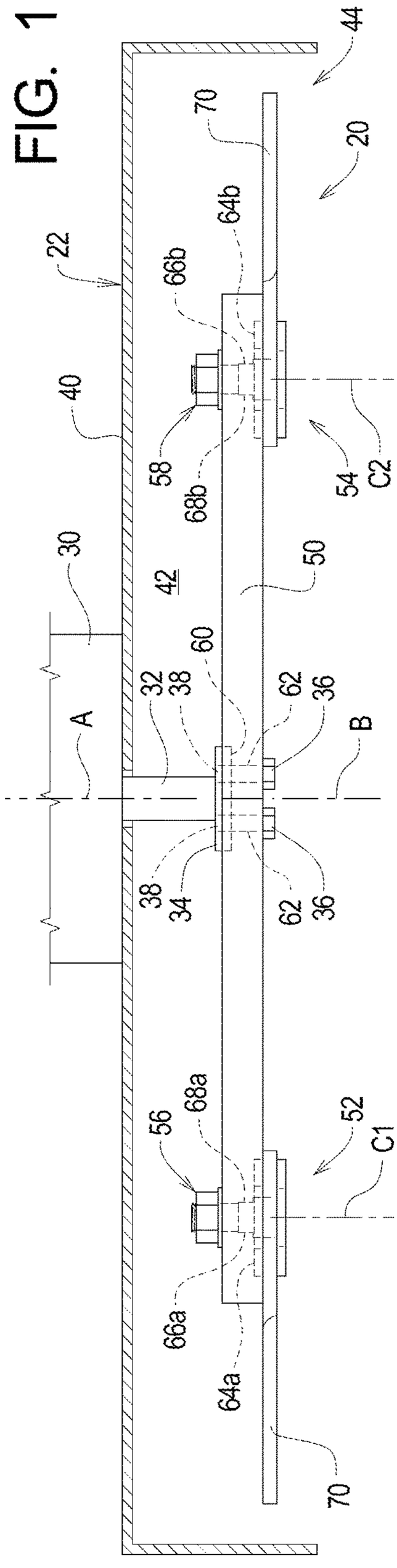
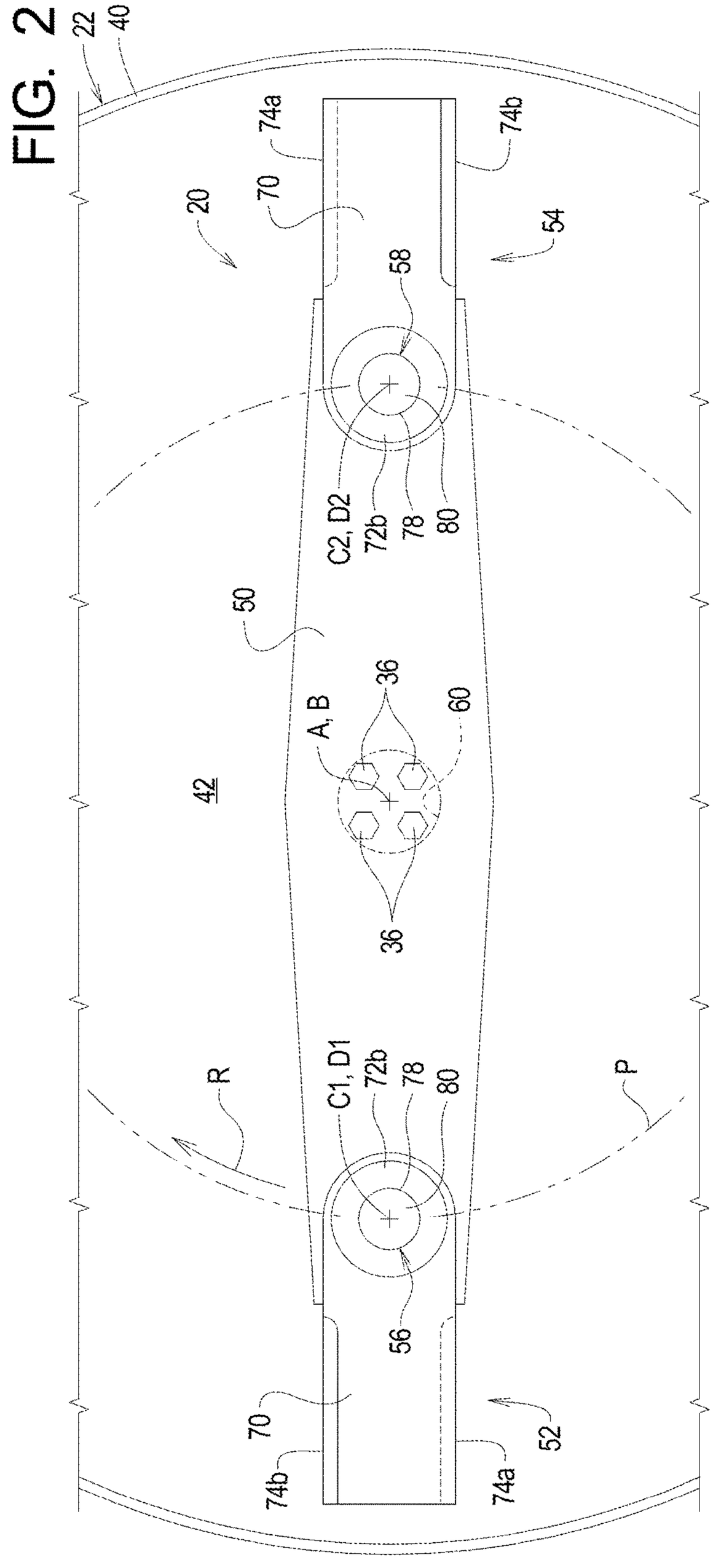

44
20
70
64b
22
66b
40
58
68b
54
C2
30
42
50
60
32
38
62
36
A
B
38
34
62
36
52
C1
56
68a
66a
64a
70

FIG. 2


22
40
74a
74b
20
70
54
58
C2, D2
72b
78
80
50
42
A, B
36
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36
R
C1, D1
72b
78
80
P
56
70
74b
74a
52

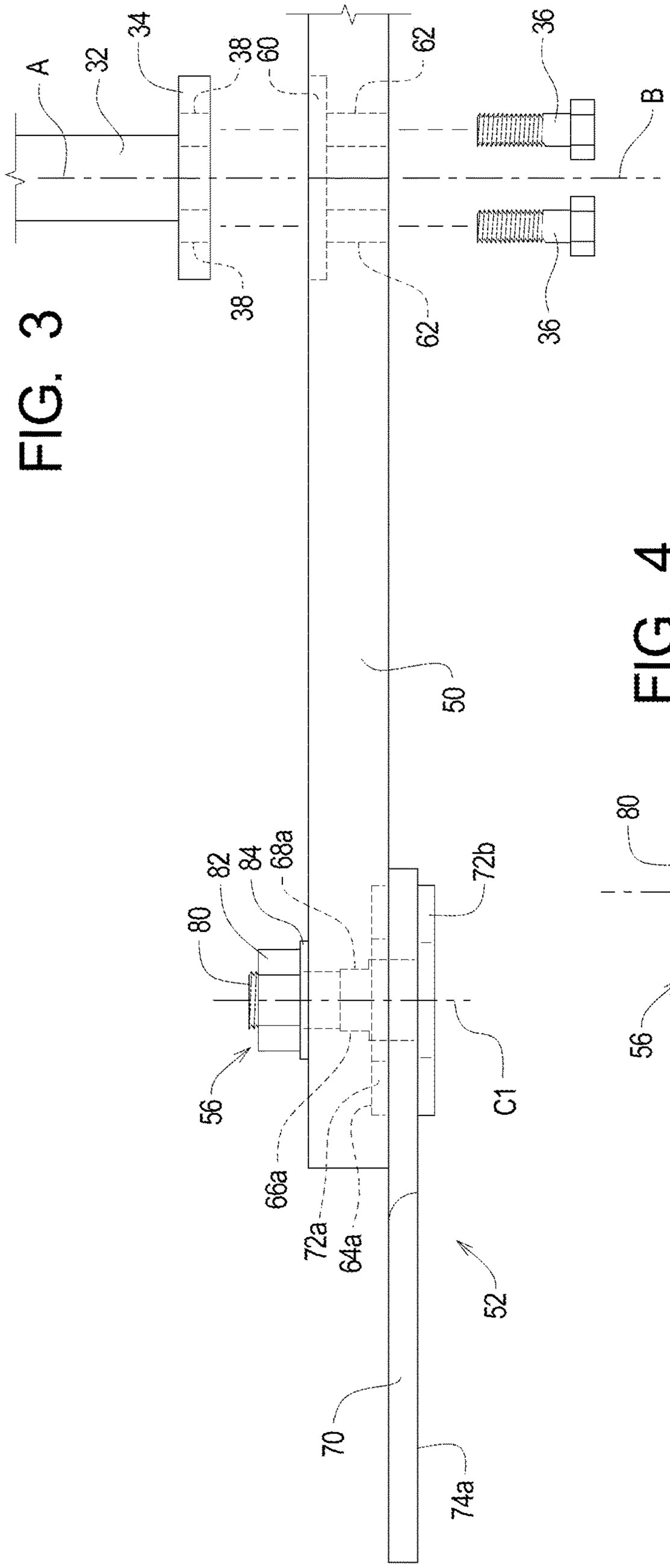

A
32
34
38
60
62
36
B
38
62
36
50
80
82
84
68a
72b
56
66a
72a
64a
70
74a
C1
52

FIG. 3

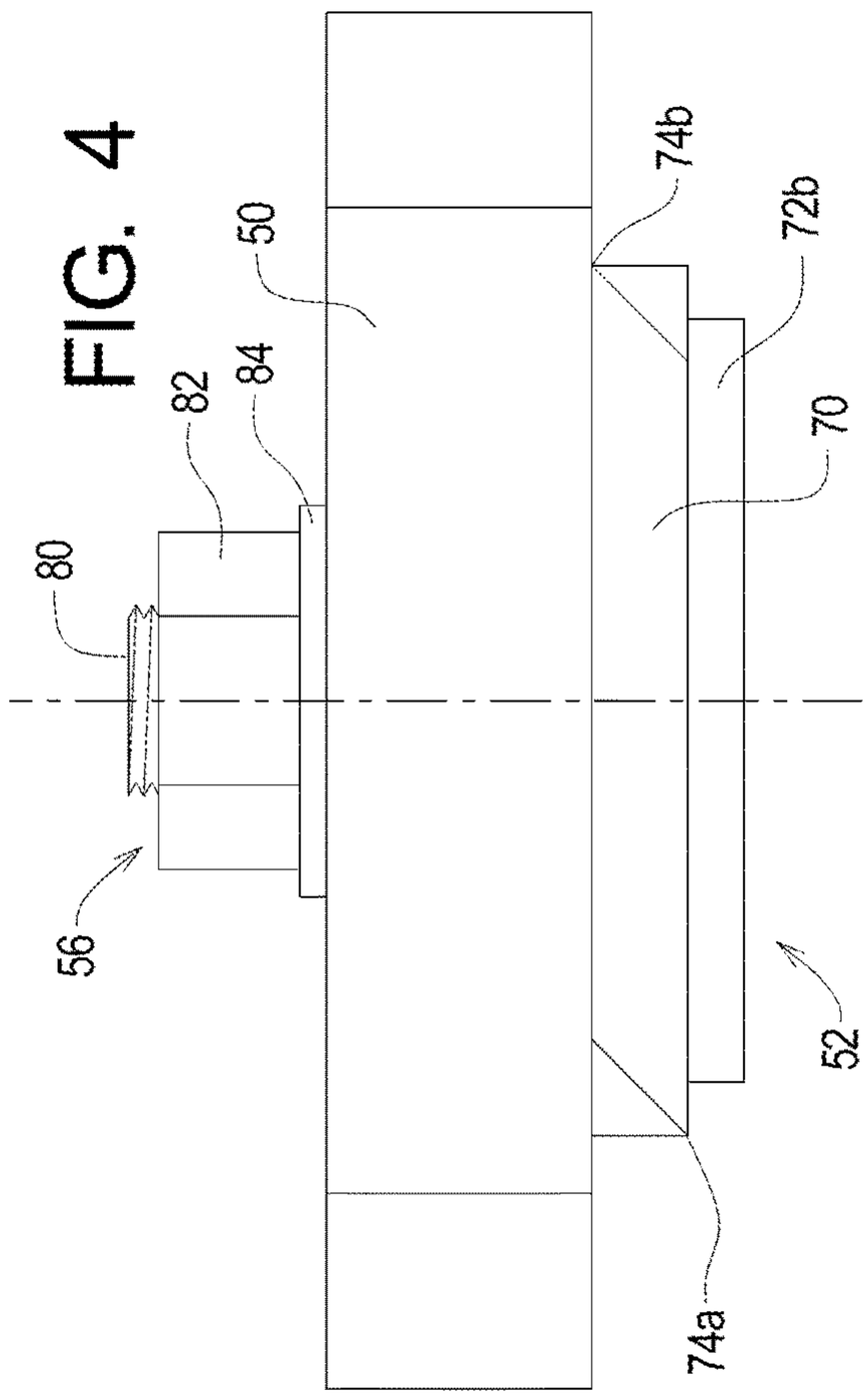

50
74b
72b
82
84
70
80
56
52
74a

FIG. 4

FIG. 5

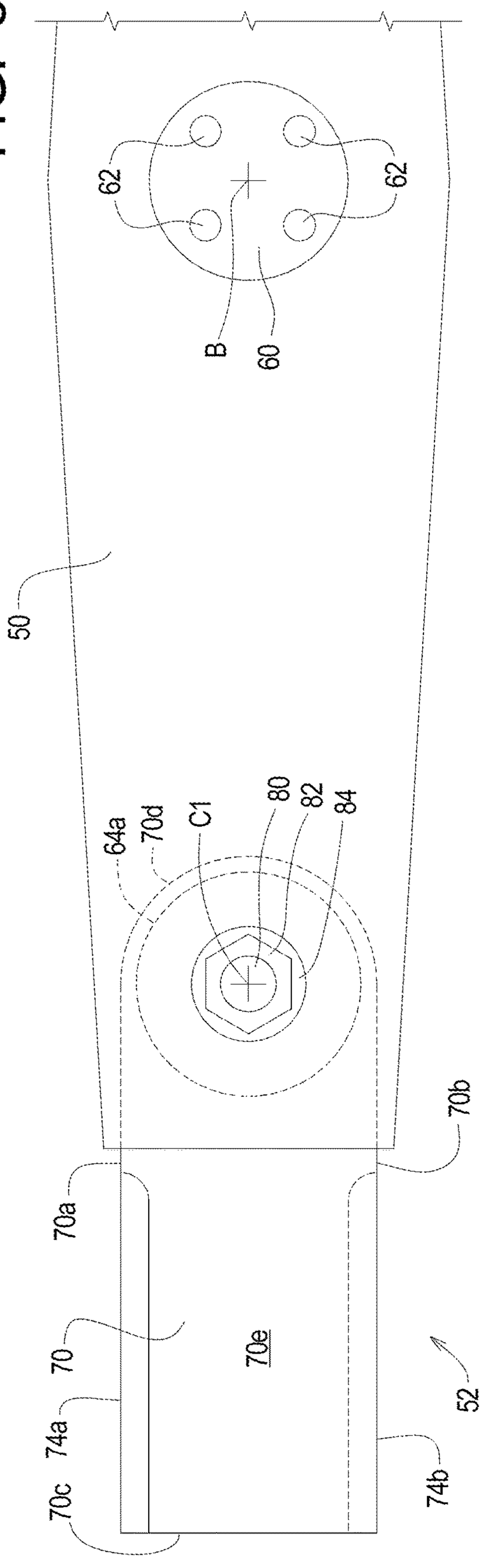

62
62
B
60
50
64a
70d
C1
80
82
84
70b
70a
70
70e
74a
74b
70c
52

FIG. 6

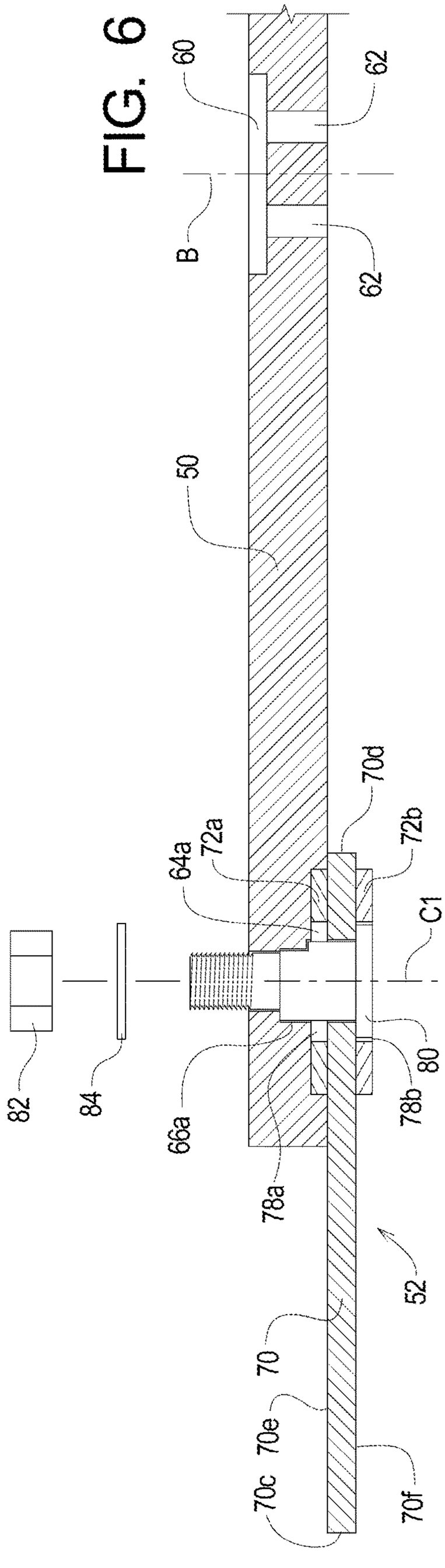

60
62
B
62
50
70d
64a
72a
72b
C1
80
82
84
78b
66a
78a
52
70
70e
70c
70f

FIG. 7

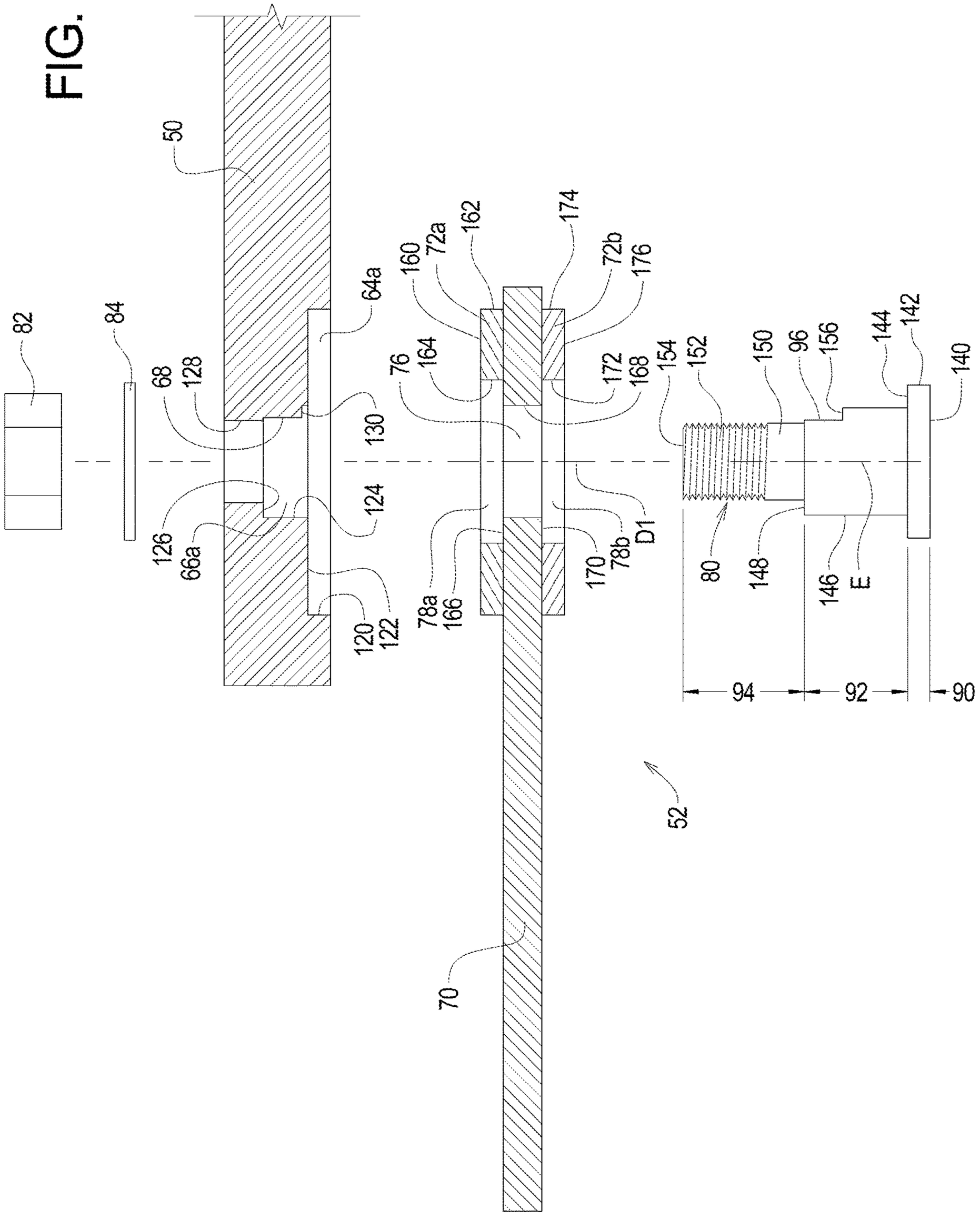

50
82
84
68
128
64a
130
126
66a
124
120
122
160
72a
162
174
72b
176
76
164
172
168
154
152
150
96
156
144
142
140
78a
166
170
78b
D1
80
148
146
E
94
92
90
52
70

FIG. 8

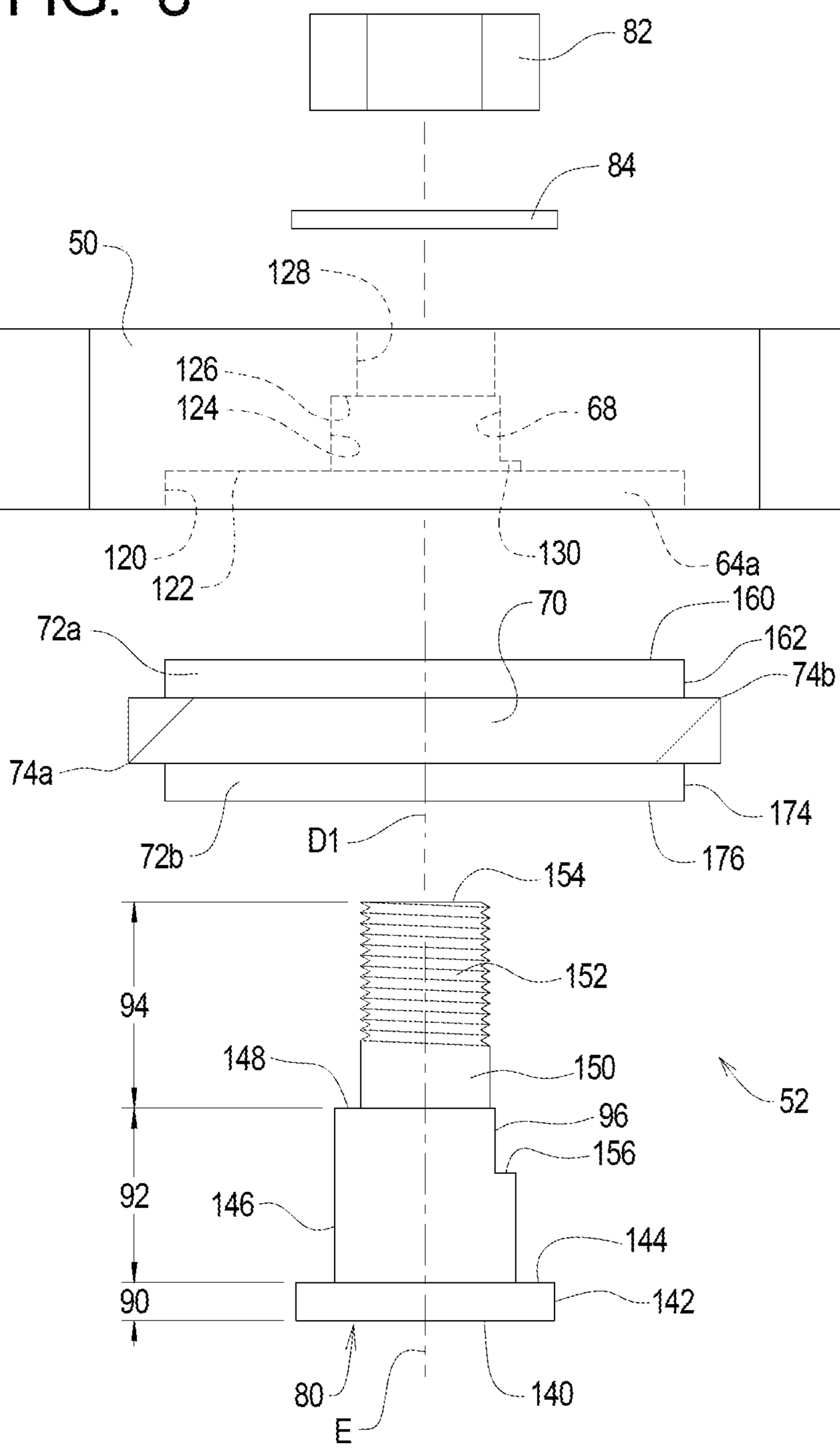

82
84
50
128
126
124
68
120
122
130
64a
70
160
72a
162
74b
74a
174
72b
D1
176
154
152
94
148
150
52
96
156
92
146
144
90
142
80
140
E

FIG. 9

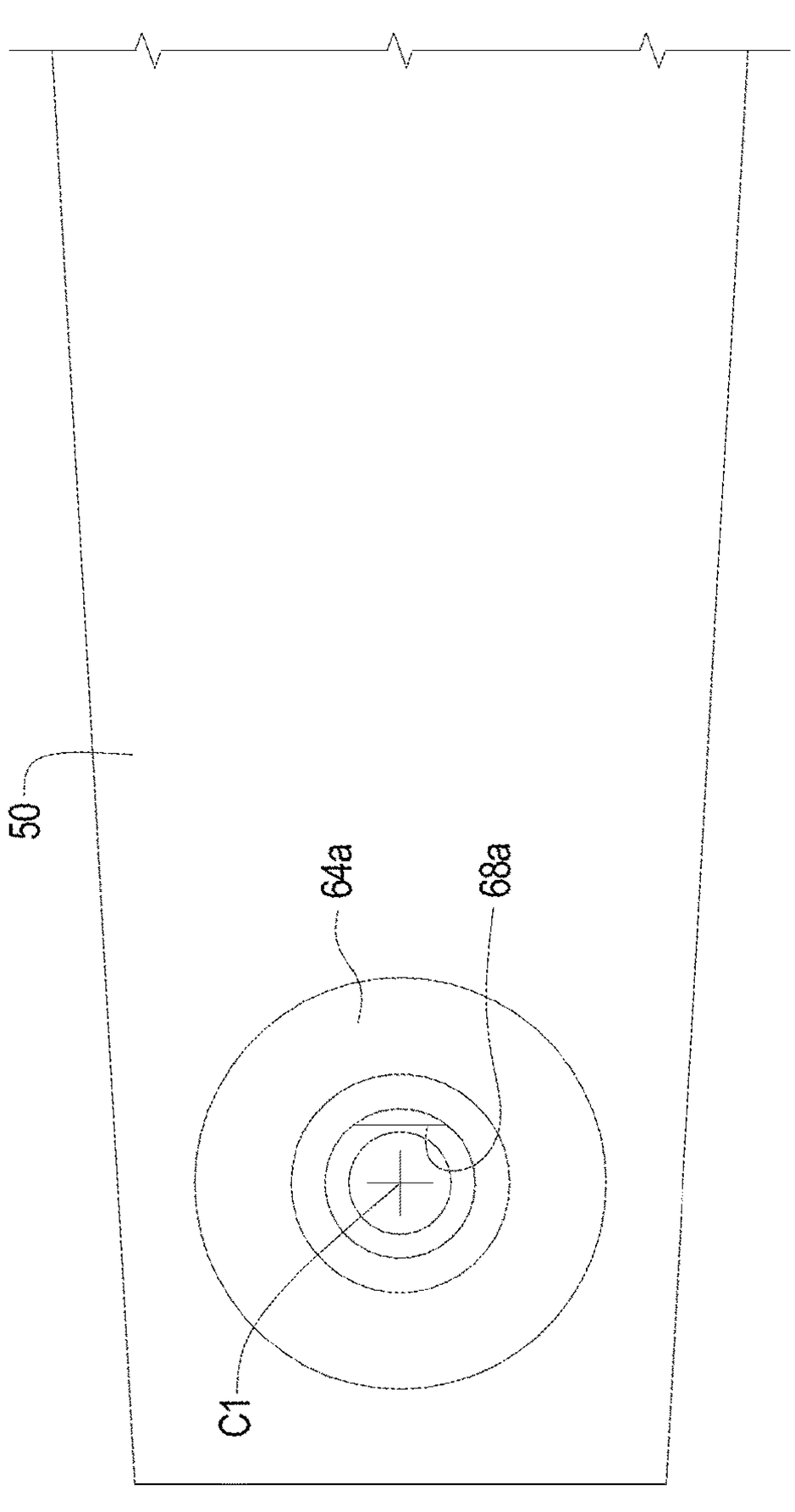


FIG. 10

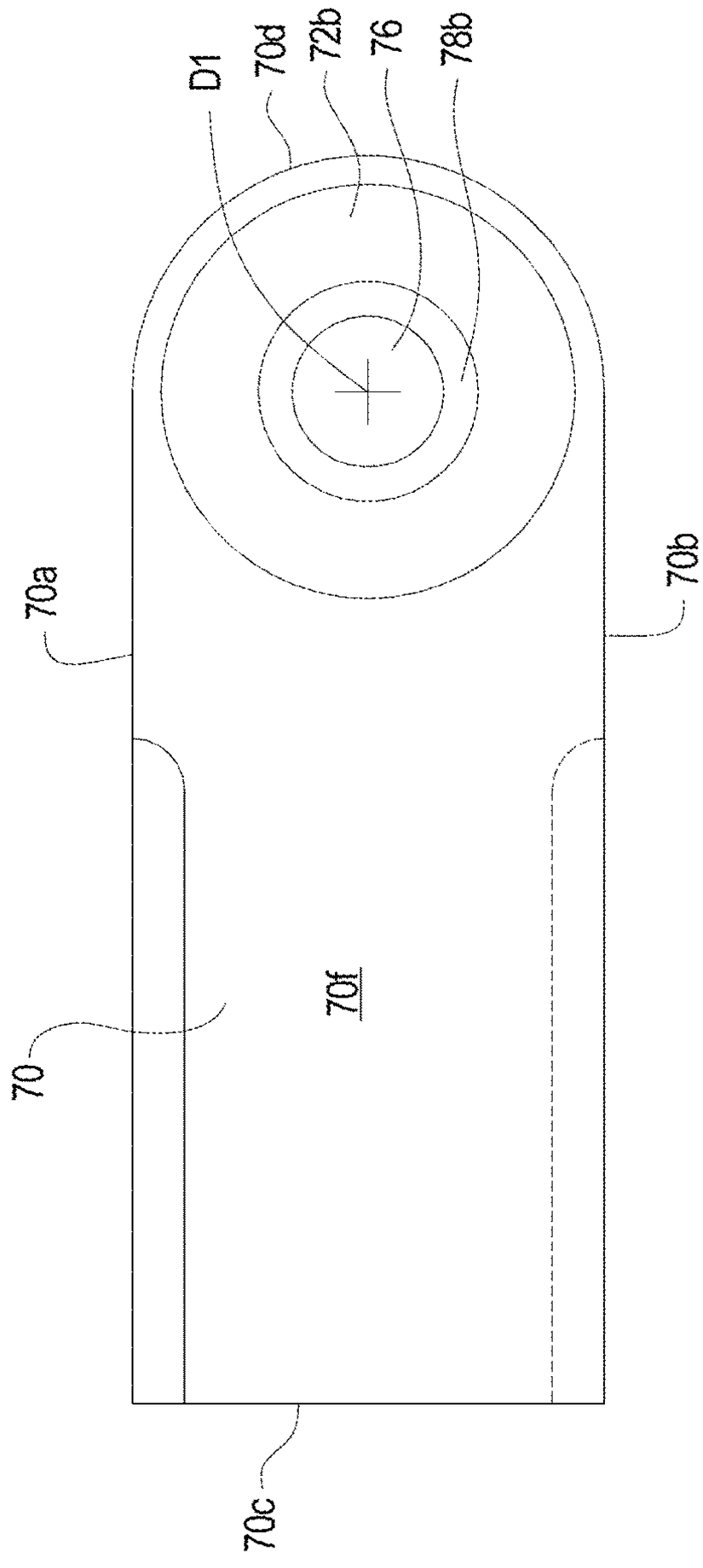


FIG. 11

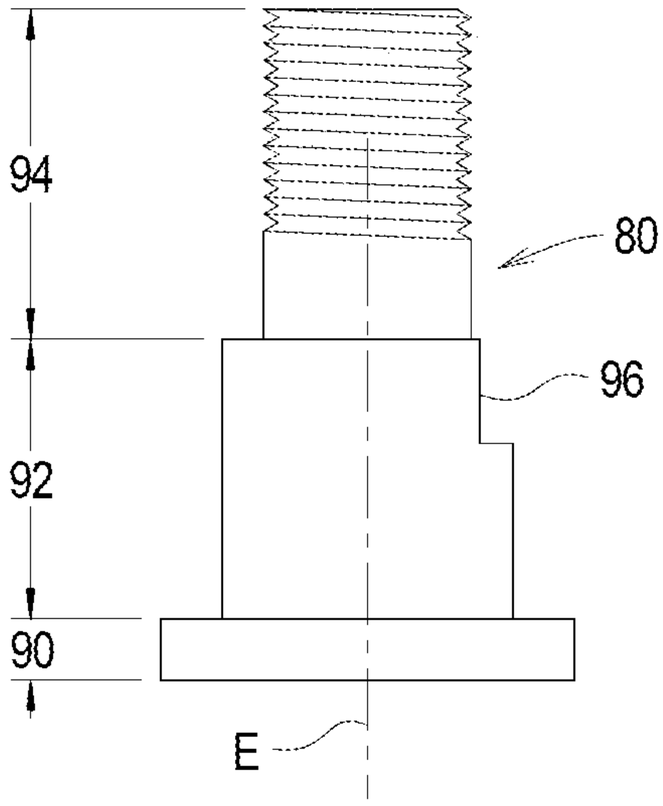


FIG. 12

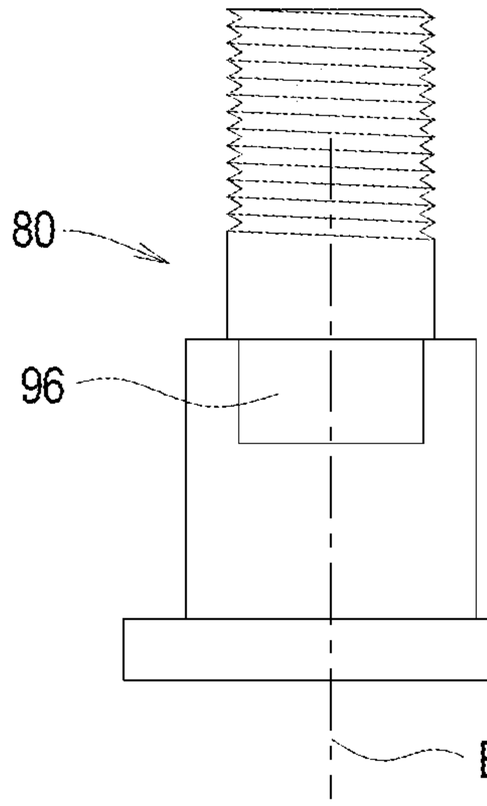


FIG. 13

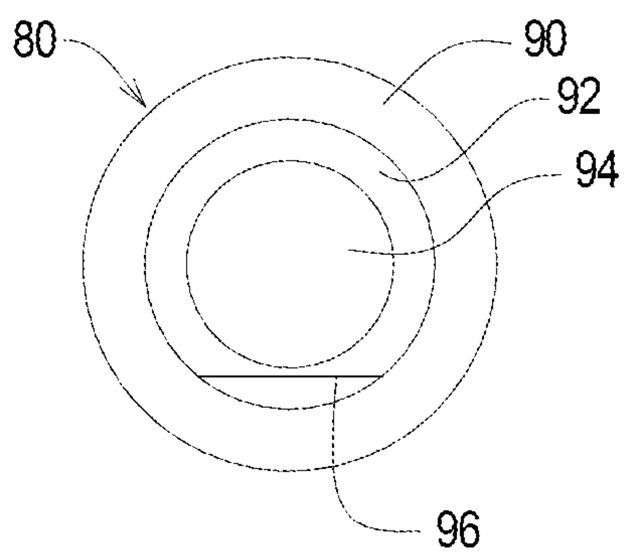


FIG. 14

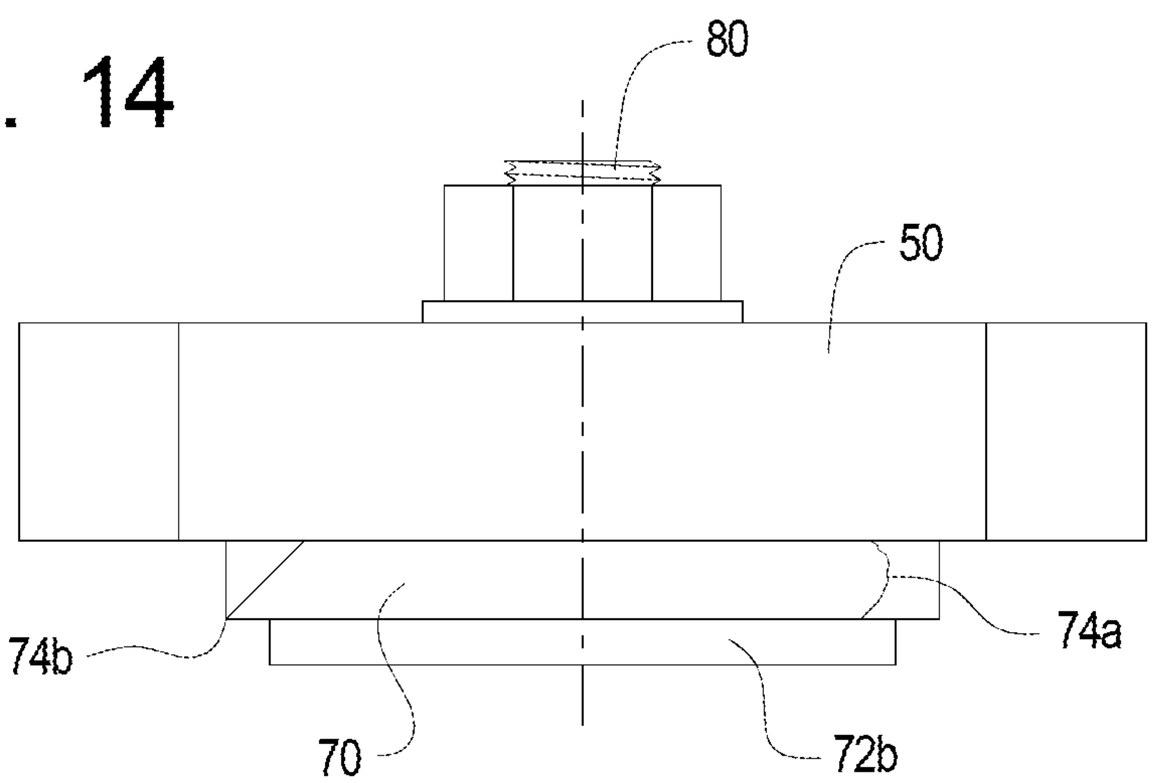


FIG. 15

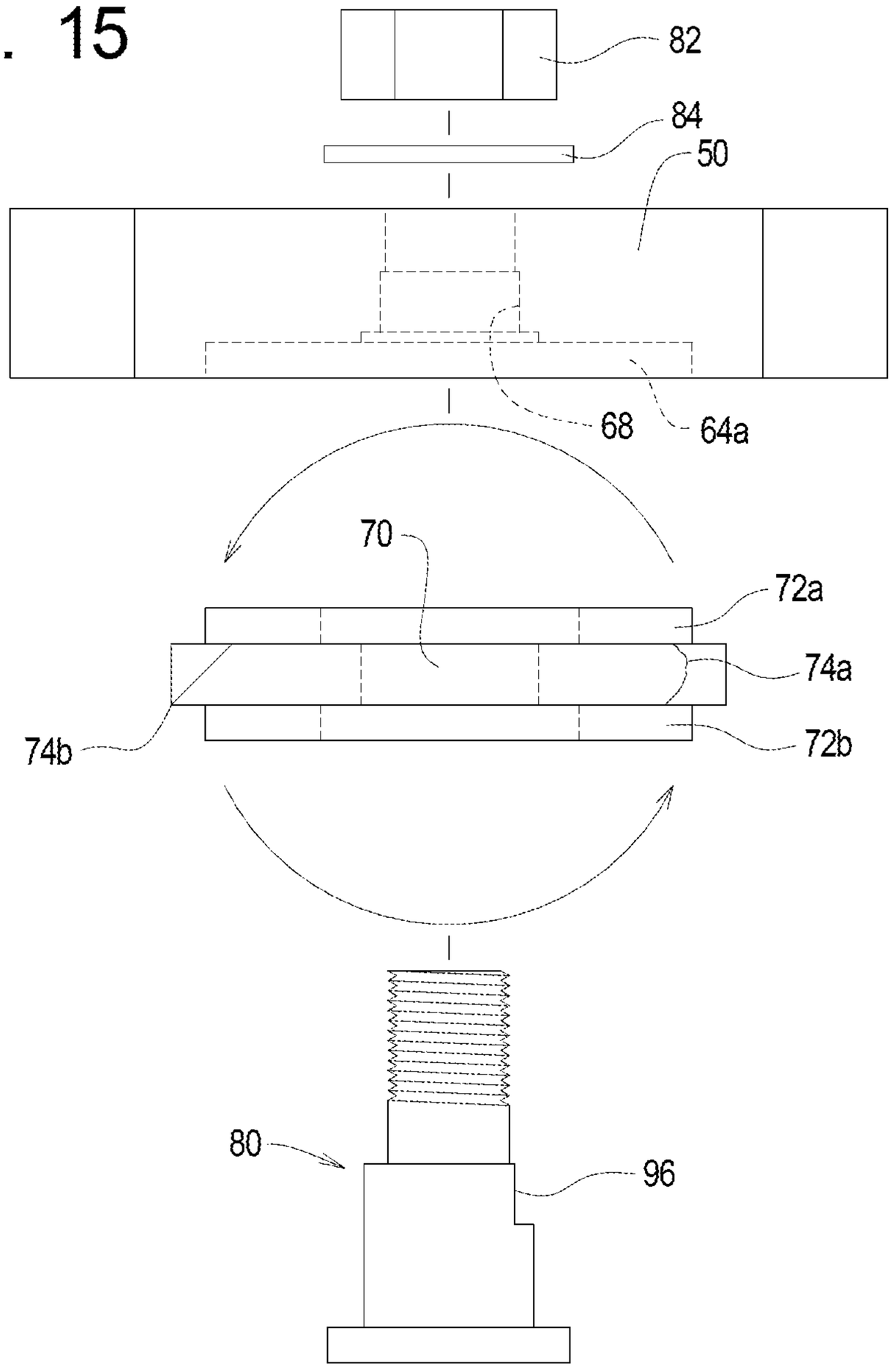


FIG. 16

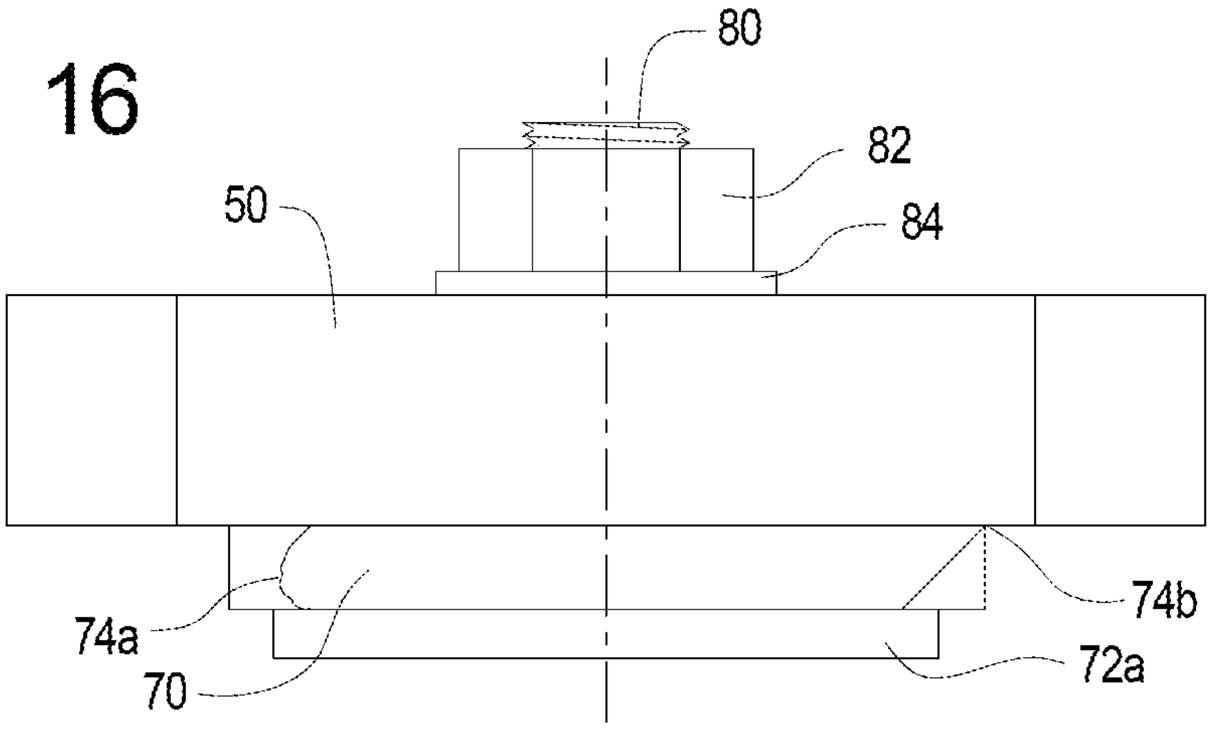


FIG. 17

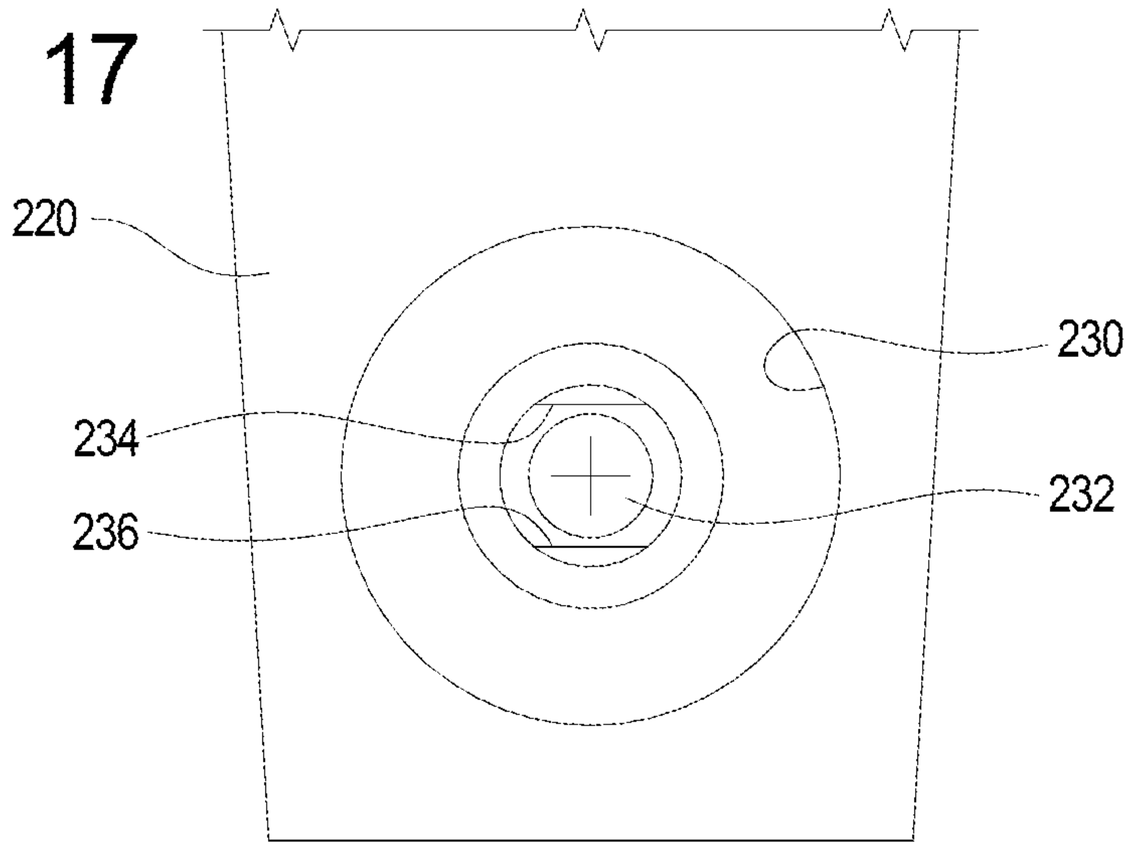


FIG. 18

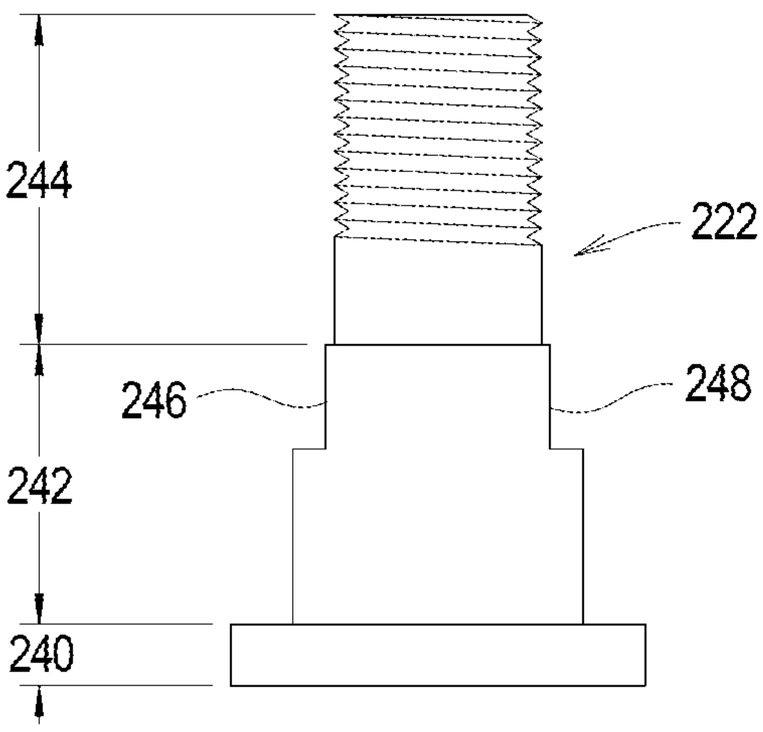


FIG. 19

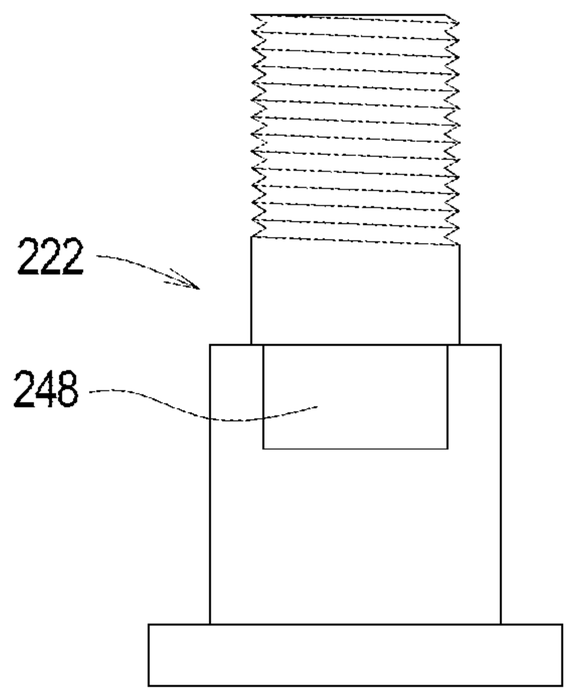
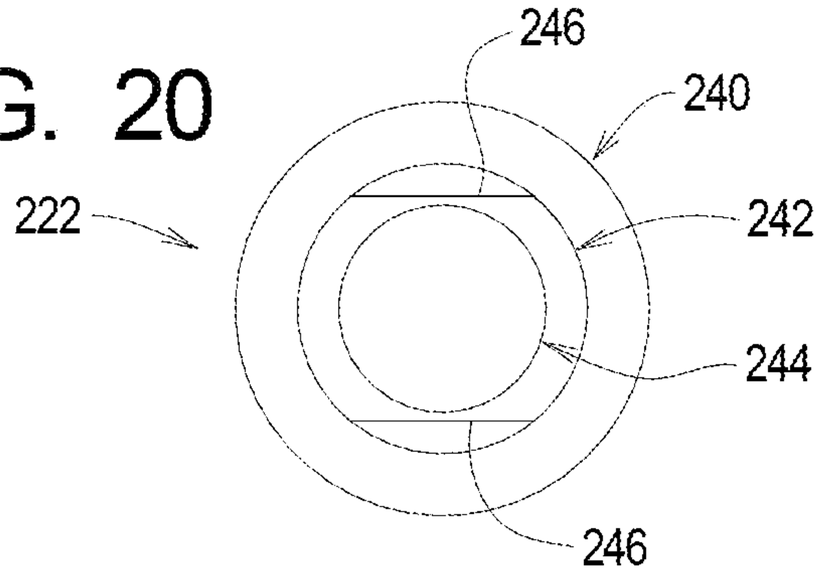


FIG. 20



ROTARY CUTTER SYSTEMS AND METHODS

RELATED APPLICATIONS

This application, U.S. patent application Ser. No. 16/582,894 is a continuation of U.S. patent application Ser. No. 15/622,914 filed Jun. 14, 2017, now U.S. Pat. No. 10,426,082, which issued on Oct. 1, 2019.

U.S. patent application Ser. No. 15/622,914 claims benefit of U.S. Provisional Application Ser. No. 62/350,540 filed Jun. 15, 2016, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to rotary brush cutter systems and methods and, in particular, to rotary cutter systems and methods with cutting blades pivotably connected to a crossbar.

BACKGROUND

Rotary brush cutters are commonly used to cut dense vegetation, or brush. A rotary brush cutter typically comprises a cutter assembly comprising a crossbar and a pair of cutter blades pivotably attached to the crossbar. When the rotary brush cutter is in use, the crossbar is rotated about a bar axis such that centripetal force causes the blades to extend radially outwardly from the bar axis. Should the cutter blade contact an obstruction made of solid material, such as rock, pipe, pavement, a large tree trunk, or the like, the resistance of the obstruction will cause the cutter blade to pivot relative to the crossbar to allow the cutter blade to clear the solid material.

The cutter assembly of a rotary brush cutter is thus rotated at high speed near the ground and other obstructions. The hardware (e.g., nuts and bolts) that rotatably attach the cutter blades to the crossbar commonly engage the ground and other obstructions. Further, the cutter blades define blade edges that wear down (become less sharp) during use.

The need thus exists for cutter assemblies for rotary brush cutters that minimize damage to the cutter assembly during use. The need also exists for cutter assemblies that may be reconfigured to prolong use of the cutter blade during use.

SUMMARY

The present invention may be embodied as a cutter assembly comprising a crossbar, first and second cutter blades, and first and second blade pins. The crossbar defines first and second bar openings, where a pin protector recess and a bar key surface are associated with each of the first and second bar openings. Each cutter blade defines a blade bolt opening and first and second blade edges. First and second blade rings are associated with the blade bolt opening, and first and second blade recesses are defined at least in part by the first and second blade rings, respectively. The first and second blade pins each define a head portion and at least one bolt key surface. The pin protector recesses are sized and dimensioned to receive either of the first and second blade rings of the first and second cutter blades. The first and second blade pins are each adapted to be inserted through one of the bar openings and one of the blade bolt openings such that the head portions of the first and second blade pins are within one of the blade recesses of the cutter blades and the bolt key surfaces of the blade pins engage the bar key surfaces of the crossbar to prevent rotation of the blade pins relative to the crossbar. The first and second cutter blades are each operable in first and second configurations, where the first blade edges are in a leading position in the first configuration and the second blade edges are in a leading position in the second configuration.

The present invention may also be embodied as a method of forming a cutter assembly comprising the following steps. A crossbar defining first and second bar openings is provided. A pin protector recess and a bar key surface are associated with each of the first and second bar openings. First and second cutter blades are provided. Each cutter blade defines a blade bolt opening and first and second blade edges. First and second blade rings are associated with the blade bolt opening. First and second blade recesses are defined at least in part by the first and second blade rings, respectively. The pin protector recesses are sized and dimensioned to receive either of the first and second blade rings of the first and second cutter blades. First and second blade pins each defining a head portion and at least one bolt key surface are provided. The first and second cutter blades are operated in first and second configurations by inserting the first and second blade pins through one of the bar openings and one of the blade bolt openings such that the head portions of the first and second blade pins are within one of the blade recesses of the cutter blades, the bolt key surfaces of the blade pins engage the bar key surfaces of the crossbar to prevent rotation of the blade pins relative to the crossbar, the first blade edges are in a leading position in the first configuration, and the second blade edges are in a leading position in the second configuration.

The present invention may also be embodied as a cutter assembly comprising a crossbar, first and second cutter blade assemblies, and first and second blade pins. The crossbar defines first and second bar openings. A pin protector recess is arranged at least partly around each of the first and second bar openings. A bar key surface is associated with each of the first and second bar openings. Each cutter blade assembly comprises a cutter blade and first and second blade rings. The cutter blade defines a blade bolt opening and first and second blade edges. The first and second blade rings are associated with the blade bolt opening. The first and second blade rings are sized and dimensioned to be received by the pin protector recesses. First and second blade recesses are defined by the cutter blade and the first and second blade rings. The first and second blade pins each define a head portion and at least one bolt key surface. The first and second blade pins are each adapted to be inserted through one of the bar openings and one of the blade bolt openings such that the head portions of the first and second blade pins are within one of the blade recesses and the bolt key surfaces engage the bar key surfaces to prevent rotation of the blade pins relative to the crossbar. The first and second cutter blades are each operable in first and second configurations, where the first blade edges are in a leading position in the first configuration and the second blade edges are in a leading position in the second configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation partial section view of a first example rotary cutter assembly of the present invention and also depicting a portion of an example support system for supporting and rotating the cutter assembly.

FIG. **2** is a bottom plan view depicting the first example rotary cutter assembly and a portion of the example support system;

FIG. **3** is a side elevation partial cutaway view illustrating one example of connecting the first example rotary cutter assembly to the example support system;

FIG. **4** is an end view of the first example rotary cutter assembly with two unused cutting edges;

FIG. **5** is a top plan view of a portion of the first example rotary cutter assembly;

FIG. **6** is a side elevation partial cutaway view of a portion of the first example rotary cutter assembly;

FIG. **7** is an exploded side, partial section view illustrating a first example connecting system for connecting a first cutter head assembly to a first example crossbar to form part of the first example rotary cutter assembly;

FIG. **8** is an exploded end, partial section view illustrating the first example connecting system for connecting the first cutter head assembly to the first example crossbar to form part of the first example rotary cutter assembly;

FIG. **9** is a bottom plan view of the first example crossbar of the first example rotary cutter assembly illustrating a first pin protector recess and first bar opening;

FIG. **10** is a bottom plan view of an example cutter blade of the first example rotary cutter assembly illustrating a first protector structure, blade bolt opening, and first blade recess;

FIG. **11** is a front elevation view of a first example blade pin of the first example rotary cutter assembly;

FIG. **12** is a side elevation view of the first example blade pin of the first example rotary cutter assembly;

FIG. **13** is a top plan view of the first example blade pin of the first example rotary cutter assembly;

FIG. **14** is an end view of the first example rotary cutter assembly with an unused sharp cutting edge and a used cutting edge, with the used cutting edge in the cutting orientation;

FIG. **15** is an exploded end view of the first example rotary cutter assembly illustrating the process of rotating the cutter blade with an unused cutting edge and a used cutting edge such that the unused cutting edge is in a cutting orientation;

FIG. **16** is an end view of the first example rotary cutter assembly with an unused cutting edge and a used cutting edge, with the unused cutting edge in the cutting orientation;

FIG. **17** is a bottom plan view of the second example crossbar of a second example rotary cutter assembly illustrating a first pin protector recess and first bar opening;

FIG. **18** is a front elevation view of a second example blade pin of the second example rotary cutter assembly;

FIG. **19** is a side elevation view of the second example blade pin of the second example rotary cutter assembly; and

FIG. **20** is a top plan view of the second example blade pin of the first example rotary cutter assembly.

DETAILED DESCRIPTION

Referring initially to FIGS. **1** and **2** of the drawing, depicted therein is a first example rotary cutter assembly **20** constructed in accordance with, and embodying, the principles of the present invention. The first example rotary cutter system **20** is supported by an example cutter deck or shroud **22**. The example cutter deck or shroud **22** is or may be conventional and will be described herein only to that extent helpful to a complete understanding of the present invention.

The example cutter deck or shroud **22** comprises a drive housing **30** and a drive shaft **32**. The example drive shaft **32** defines a drive axis A and terminates in a drive flange **34**. Drive bolts **36** are inserted through flange openings **38** in the drive flange **34** to secure the first example rotary cutter system **20** to the example cutter deck or shroud **22** as will be described in further detail below. The example cutter deck or shroud **22** further comprises a cutter housing **40** secured to the drive housing **30**. The cutter housing **40** defines a cutter chamber **42**, and access to the cutter chamber **42** is through a bar opening **44**.

As is conventional, the example cutter deck or shroud **22** is supported by a movable arm (not shown) from a tractor or other vehicle (not shown). For example, the drive housing **30** may contain a motor (not shown) operatively connected to the drive shaft **32** or may contain a gear box (not shown) operatively connected to the drive shaft **32**, the gear box being operatively connected to a motor (not shown) supported by the vehicle. In any event, the drive shaft **32** is axially rotated about the drive axis A. The cutter housing **40** substantially surrounds the example rotary cutter assembly **20** to limit access to the rotating rotary cutter assembly **20**. However, the arm is capable of repositioning the drive housing **30** and cutter housing **40** to arrange the bar opening **44** such that the rotating rotary cutter assembly **20** comes into contact with plant material (not shown) to be cut.

As shown in FIGS. **1** and **2**, the first example rotary cutter assembly **20** comprises a crossbar **50** defining a bar axis B and first and second cutter axes C**1** and C**2**, first and second cutter head assemblies **52** and **54**, and first and second blade pin assemblies **56** and **58**. The crossbar **50** defines a drive recess **60**, a plurality of drive bolt openings **62**, first and second pin protector recesses **64***a* and **64***b*, and first and second bar openings **66***a* and **66***b*. The example bar axis B extends through the drive recess **60**, while the first and second cutter axes C**1** and C**2** extend through the first and second bar openings **66***a* and **66***b*, respectively. The example crossbar **50** is wider adjacent to the bar axis B and tapers towards each of the first and second cutter axes C**1** and C**2** as perhaps best shown in FIG. **2**.

Each of the first and second pin protector recesses **64***a* and **64***b* defines a key surface, with only a first key surface **68***a* of the example first pin protector recess **64***a* visible in FIG. **6-9**. In particular, the example first and second cutter head assemblies **52** and **54** cutter are the same, the first and second blade pin assemblies **56** and **58** are the same, and only the example first cutter head assembly **52** and the example first blade pin assembly **56** will be described herein in detail below.

The example first cutter head assembly **52***a* comprises a cutter blade **70** defining first and second protector structures **72***a* and **72***b*, first and second cutter blade edges **74***a* and **74***b*, a first blade bolt opening **76**, and first and second blade recesses **78***a* and **78***b*. The example first cutter blade **70** is a flat metal bar defining first and second side edges **70***a* and **70***b* on which the first and second cutter blade edges **74***a* and **74***b* are formed, respectively, by grinding or the like. The side edges **70***a* and **70***b* extend between a straight distal end **70***c* and a curved proximal end **70***d* of the flat metal bar forming the example first cutter blade **70**.

The example first and second protector structures **72***a* and **72***a* are rings that are integrally formed with or attached to (e.g., by welding) first and second faces **70***e* and **70***f* of the flat metal bar forming the example first cutter blade **70** to form the blade recesses **78***a* and **78***b*. The example first blade bolt opening **76** extends between the first and second faces **70***e* and **70***f*, is coaxially aligned with openings defined by the first and second protector structures **72***a* and **72***b*, and is centered relative to the radius of curvature of the proximal end **70***d* of the flat metal bar forming the example first cutter blade **70**. The example first and second pin protector

recesses **78***a* and **78***b* are defined by the first and second faces **70***e* and **70***f* and the first and second protector structures **72***a* and **72***b*, respectively. The first blade bolt opening **76** and the first and second blade recesses **78***a* and **78***b* are cylindrical and aligned along a common blade axis D**1** as perhaps best shown in FIG. **10**.

As shown in FIGS. **1** and **2**, the first and second cutter head assemblies **52** and **54** define first and second blade axes D**1** and D**2**, respectively. FIGS. **1** and **2** also show that the first and second blade axes D**1** and D**2** are aligned with the first and second cutter axes C**1** and C**2**, respectively, when the first example rotary cutter assembly **20** is formed.

FIGS. **7**, **8**, and **11-13** perhaps best illustrate that the example first blade pin assembly **56** comprise a blade pin **80**, a pin nut **82**, and a pin washer **84**. The example blade pin **80** comprises a head portion **90**, a collar portion **92**, and an end portion **94**. A second key surface **96** is formed on the collar portion **92** of the example blade pin **80**. Except for the example second key surface **96**, the first blade pin **80** is substantially symmetrical about a bolt axis E.

Although the example protector structures **72***a* and **72***b* take the shape of a closed ring, the protector structures **72***a* and **72***b* may be formed by a raised structure on the leading edge of the cutter blade **70** of any geometric shape (e.g., rectangular, semispherical) that inhibits contact with the head **90** of the blade pin **80** during rotation of the cutter head assemblies **52** and **54**. The protector structures **72***a* and **72***b* thus inhibit damage to the blade pins **80** in general and the head portions **90** thereof in particular.

To use the first example cutter assembly **20**, the first and second blade pin assemblies **56** and **58** are used to secure the first and second cutter head assemblies **52** and **54** to the crossbar **50**, and the drive bolts **36** are used to secure the crossbar **50** to the drive flange **34** and thus the drive shaft **32**. So secured, rotation of the drive shaft **32** rotates the crossbar **50** about the drive axis A such that the crossbar **50** and cutter head assemblies **52** and **54** rotate about a circular path P centered about the drive axis A. The example crossbar **50** rotates in a clockwise direction as shown by arrow R in FIG. **2**.

To secure the example cutter blades **70** to the crossbar **50** to form the first example cutter assembly **20**, the cutter blades **70** are arranged such that the first blade rings **72***a* are within the first and second pin protector recesses **64***a* and **64***b* in the crossbar **50**. The first cutter blade edges **74***a* of the cutter blades **70** are facing in a clockwise direction of rotation R at this point. The first and second blade pin assemblies **56** and **58** are then formed by inserting the blade bolts **80** through the blade bolt openings **76** of the cutter blades **70** and the first and second bar openings **66***a* and **66***b* of the crossbar **50**, respectively. The pin washers **84** are then arranged over the end portions **94** of the pins **80**, and the pin nuts **82** are threaded onto the threaded surfaces of the end portions **94** of the blade pins **80**. At this point, the axes C**1** and D**1** are aligned, and the axes C**2** and D**2** are aligned, and the cutter blades **70** are capable of rotating relative to the crossbar **50** about the aligned axes C**1**,D**1** and C**2**,D**2**. The first and second key surfaces **68** and **96** engage each other to prevent rotation of the blade pins **80** about the aligned axes C**1**,D**1** and C**2**,D**2**.

The cutter assembly **20** is then secured to the shroud **22** by arranging the crossbar **50** such that the drive flange **34** is within the drive recess **60** and the drive openings **62** are aligned with the flange openings **38**. The drive bolts **36** are then inserted through the aligned drive openings **62** and flange openings **38** to secure the drive flange **34** within the drive recess **60**. The drive bolts **36** may be threaded into the flange openings **38** to secure the drive bolts **36** in place within the drive openings **62** and flange openings **38**, or separate drive nuts (not shown) may be used to secure the drive bolts **36** in place within the drive openings **62** and flange openings **38**. At this point, rotation of the drive flange **34** is transmitted to the crossbar **50** through the drive bolts **36**.

When attached to the shroud **22**, the cutter assembly **20** is arranged and rotated such that the first cutter edges **74***a* engage and cut vegetation in the path of rotation. The cutter blades **70** are held by centripetal force in an extended position as shown, for example, in FIGS. **1**, **2**, and **5**. In this extended position, the cutter blades **70** are in line with the crossbar **50** during rotation of the crossbar **50** and thus will cut all vegetation in the path of rotation of the cutter blades **70**. However, if the cutter blades **70** engage a hard object, such as a rock, curb, trunk, or stump, the cutter blades **70** will rotate counter clockwise to the crossbar **50** to reduce the likelihood of damage to the crossbar **50** and/or the shroud **22**.

After a period of time, the first cutter edges **74***a* will become used as shown in FIGS. **15** and **16**. At this point, one or both of the cutter blades **70** may be removed and rotated as shown in FIG. **15**. At this point, the second blade rings **72***b* of the cutter blades **70** are within the first and second crossbar pin protector recesses **64***a* and **64***b* and the second blade edges **74***b* face the direction of rotation R. The blade retaining the blade pins **80** are installed through the cutter blades **70** and crossbar **50** as shown in FIG. **16** with the still unused second cutter edges **74***b* in the leading position such that rotation of the crossbar in the direction R causes the second cutter edges **74***b* to engage and cut vegetation within the path of rotation of the cutter blades **70**.

Turning now to FIGS. **9-13**, the details of the example blade pin **80** and of the engagement of the blade pin **80** with the blade recesses **78***a* or **78***b* and of the blade rings **72***a* or **72***b* with the first and second pin protector recesses **64***a* and **64***b* will now be described in further detail.

As perhaps best shown in FIGS. **7** and **8**, the example first blade recess **64***a* defines a first inner surface **120**, a first radial surface **122**, a second inner surface **124**, a second radial surface **126**, a third inner surface **128**, and a stop surface **130**. The example first and second radial surfaces **122** and **126** are annular. The example first and second inner surfaces **120** and **124** are cylindrical, and the example third inner surface **128** is cylindrical except that the example stop surface **130**, which is flat and parallel to the cutter axis C**1**, extends across a portion of the third inner surface **128**.

The example blade pin **80** defines a head surface **140**, a head outer surface **142**, a head radial surface **144**, a collar outer surface **146**, a collar radial surface **148**, an end spacing surface **150**, an end threaded surface **152**, an end surface **154**, and a second stop surface **156**. The example head surface **140** and end surface **154** are substantially circular. The head outer surface **142** and end spacing surface **150** are substantially cylindrical. The collar outer surface **146** is substantially cylindrical except that the second stop surface **156**, which is flat and parallel to the bolt axis E, is formed by removing a portion of the collar outer surface **146**. The head radial surface **144** and a collar radial surface **148** are annular. The end threaded surface **152** is substantially cylindrical but is threaded to match threading on the pin nut **82**.

With the first blade ring **72***a* and second blade ring **72***b* secured to or integrally formed with the first and second blade faces **70***e* and **70***f*, respectively, the cutter blade **70** defines a first ring radial surface **160**, a first ring outer surface **162**, a first ring inner surface **164**, first blade radial

surface **166**, a blade inner surface **168**, a second blade radial surface **170**, a second ring inner surface **172**, a second ring outer surface **174**, and a second ring radial surface **176**. The first ring radial surface **160**, first and second blade radial surfaces **166** and **170**, and second ring radial surface **176** are all annular. The first and second ring outer surfaces **162** and **174**, first and second ring inner surface **164** and **172**, and a blade inner surface **168** are cylindrical. All of the surfaces defined by the blade rings **72***a* and **72***b* and blade faces **70***e* and **70***f* are coaxially aligned with the blade axis D**1**.

To assemble the cutter blades **70** onto the crossbar **50**, the first ring radial surface **160** is arranged to engage the first recess radial surface **122**, and the first ring outer surface **162** is arranged such that it is adjacent to the first recess inner surface **120**. The blade pins **80** are then inserted such that the bolt head radial surface **144** is in contact with the second blade radial surface **170** and the bolt head outer surface **142** is adjacent to the second ring inner surface **172** as shown in FIGS. **7** and **8**.

When the blade pin assemblies **56** and **58** are assembled with the first and second cutter head assemblies **52** and **54**, the first and second key surfaces **68***a* and **68***b* engage the corresponding key surfaces **96** on the blade pins **80** to prevent axial rotation of the blade pin relative to the crossbar **50**. Similarly, the first and second stop surfaces **130** and **156** engage each other when the blade pins **80** are fully inserted into the first and second pin protector recesses **64***a* and **64***b*, respectively. The pin washer **84** and pin nut **82** are threaded onto the end threaded surface **152** to secure the blade pins **80** in their fully inserted positions.

This arrangement allows the cutter blades **70** to rotate relative to the crossbar **50** as described above. However, with the key surfaces **68***a,b* and **96** and the stop surfaces **130** and **156** in contact as shown in FIGS. **7** and **8**, the blade pin assemblies **56** and **58** do not rotate relative to the crossbar **50**. At this point, the head surface **140** of the head portion **90** of the blade pin **80** is flush or substantially co-planar with the surface **176** defined by the protector structure **72***b* of the cutter blade **70**. The blade pin assemblies **56** and **58** are therefor substantially protected from direct impact during use of the cutter assembly **20**.

Turning now to FIGS. **17-20**, the details of a second example crossbar **220** and a second example blade pin **222** will now be described. The second example crossbar **220** and second example blade pin **222** are designed to be used with a cutter blade such as the cutter blade **70** described above.

The second example crossbar **220** comprises a drive recess (not visible in FIG. **17**), drive openings (not visible in FIG. **17**), at least one pin protector recess **230** and at least one bar opening **232**. Typically, two pin protector recesses **230** and two bar openings **232** are symmetrically spaced on each end of the crossbar **220**, but only one is described and depicted herein for purposes of simplicity. First and second key surfaces **234** and **236** are associated with each pin protector recess **230**.

The second example blade pin **222** comprises a head portion **240**, a collar portion **242**, and an end portion **244**. Third and fourth key surfaces **246** and **248** are formed on the collar portion **242**.

The second example blade pin **222** is used to secure a cutter blade such as the cutter blade **70** described above to the second example crossbar **220**. In particular, when the blade pin **222** is fully inserted into the bar opening **232**, the first and second key surfaces **234** and **236** will engage the third and fourth key surfaces **246** and **248** to prevent rotation of the blade pin **222** relative to the crossbar **220** but still allow rotation of the cutter blade relative to the crossbar **220**. In other respects, the second example crossbar **220** and the second example blade pin **222** are or may be the same as the crossbar **50** and blade pin **80** described above.

What is claimed is:

1. A cutter assembly comprising:

a crossbar defining first and second bar openings, where a pin protector recess and a bar key surface are associated with each of the first and second bar openings;

first and second cutter blades, where each cutter blade defines a blade bolt opening and first and second blade edges, where

first and second blade rings are associated with the blade bolt opening, and

first and second blade recesses are defined at least in part by the first and second blade rings, respectively; and

first and second blade pins each defining a head portion and at least one bolt key surface; wherein

the pin protector recesses are sized and dimensioned to receive either of the first and second blade rings of the first and second cutter blades;

the first and second blade pins are each adapted to be inserted through one of the bar openings and one of the blade bolt openings such that

the head portions of the first and second blade pins are within one of the blade recesses of the cutter blades, and

the bolt key surfaces of the blade pins engage the bar key surfaces of the crossbar to prevent rotation of the blade pins relative to the crossbar; and

the first and second cutter blades are each operable in first and second configurations, where the first blade edges are in a leading position in the first configuration and the second blade edges are in a leading position in the second configuration.

2. A cutter assembly as recited in claim **1**, further comprising first and second pin nuts, where the first and second pin nuts engage the first and second blade pins, respectively.

3. A cutter assembly as recited in claim **1**, in which:

the cutter blades defines first and second blade surfaces; and

the head portion of each of the blade pins defines a head surface; wherein

the head surfaces are substantially flush with one of the blade surfaces when the blade pins are inserted through the blade bolt openings and the bar openings.

4. A method of forming a cutter assembly comprising the steps of:

providing a crossbar defining first and second bar openings, where a pin protector recess and a bar key surface are associated with each of the first and second bar openings;

providing first and second cutter blades, where each cutter blade defines a blade bolt opening and first and second blade edges, where

first and second blade rings are associated with the blade bolt opening,

first and second blade recesses are defined at least in part by the first and second blade rings, respectively, and

the pin protector recesses are sized and dimensioned to receive either of the first and second blade rings of the first and second cutter blades; and

providing first and second blade pins each defining a head portion and at least one bolt key surface; wherein

operating the first and second cutter blades in first and second configurations by inserting the first and second blade pins through one of the bar openings and one of the blade bolt openings such that

the head portions of the first and second blade pins are within one of the blade recesses of the cutter blades,

the bolt key surfaces of the blade pins engage the bar key surfaces of the crossbar to prevent rotation of the blade pins relative to the crossbar,

the first blade edges are in a leading position in the first configuration, and

the second blade edges are in a leading position in the second configuration.

5. A method as recited in claim **4**, further comprising the step of arranging first and second pin nuts to engage the first and second blade pins, respectively, to secure the first and second blade pins relative to the crossbar.

6. A method as recited in claim **4**, in which:

the step of providing the cutter blades comprises the step of defining first and second blade surfaces on each cutter blade;

the head portion of each blade pin defines a head surface; and

the head surfaces are substantially flush with one of the blade surfaces when the blade pins are inserted through the blade bolt openings and the bar openings.

7. A cutter assembly comprising:

a crossbar defining first and second bar openings, where the cross bar defines

a pin protector recess arranged at least partly around each of the first and second bar openings, and

a bar key surface associated with each of the first and second bar openings;

first and second cutter blade assemblies, where each cutter blade assembly comprises

a cutter blade defining a blade bolt opening and first and second blade edges, and

first and second blade rings associated with the blade bolt opening, where

the first and second blade rings are sized and dimensioned to be received by the pin protector recesses, and

first and second blade recesses are defined by the cutter blade and the first and second blade rings; and

first and second blade pins each defining a head portion and at least one bolt key surface; wherein

the first and second blade pins are each adapted to be inserted through one of the bar openings and one of the blade bolt openings such that

the head portions of the first and second blade pins are within one of the blade recesses, and

the bolt key surfaces engage the bar key surfaces to prevent rotation of the blade pins relative to the crossbar; and

the first and second cutter blades are each operable in first and second configurations, where the first blade edges are in a leading position in the first configuration and the second blade edges are in a leading position in the second configuration.

8. A cutter assembly as recited in claim **7**, further comprising first and second pin nuts, where the first and second pin nuts engage the first and second blade pins, respectively.

9. A cutter assembly as recited in claim **7**, in which:

the blade rings define first and second blade surfaces; and

the head portion of each of the blade pins defines a head surface; wherein

the head surfaces are substantially flush with one of the blade surfaces when the blade pins are inserted through the blade bolt openings and the bar openings.

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